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ID No. : BR150202

様式 Form 6 - 2
被招へい研究者作成 / By Fellow
(招へい 2015)

必ず ID 番号を記入すること

Be sure to enter Fellow's ID number

独立行政法人日本学術振興会理事長 殿

To: President, Japan Society for the Promotion of Science

研究報告書(被招へい研究者作成)
RESEARCH REPORT (By Fellow)
(Cover Page)

This is the cover page of my attached JSPS research report.

1. Name of Fellow, Affiliation	SAID ENNAHAR, UNIVERSITY OF STRASBOURG, FRANCE
2. Name of Host, Position, Affiliation	KENJI SONOMOTO, PROFESSOR, KYUSHU UNIVERSITY
3. Research Theme under the Fellowship	FOOD MICROBIOLOGY, LACTIC ACID BACTERIA, PROTEOMICS
4. Fellowship Period	<u>12</u> / <u>14</u> / <u>2015</u> ~ <u>01</u> / <u>24</u> / <u>2016</u> From (Month/Day/Year) To (Month/Day/Year)
5. Future Contact Information	Please look on the reverse side.
6. Outline of academic activities	Your report must be written in A4 size. Otherwise, you are free to choose its format.

Note

Please select one picture (more than 800 kilobytes) which was taken when the Fellow conducted his/her research or provided a lecture, and attach it to Form 6-2. JSPS may later upload the excellent reports (Form 6-2) with the pictures of their authors in activities on our website. Fellows who do not want to have their pictures posted on our website are not asked to attach pictures to Form 6-2.

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Outline of academic activities (BR150202)

A common feature between the research performed in Japan and the one that I am currently carrying out is the topic of antimicrobial peptides (bacteriocins) with relation to their role in health and in the preservation of foods. Although some cooperative work with Japan on this topic was possible, due to a lack of structured and cohesive research programs and lack of funding, this cooperation was hardly sustainable. The objective of my visit to my Japanese colleagues through the BRIDGE Program was to explore ways to build sustainable and strong collaborative research.

1) Kyushu University's laboratory

Stay the Laboratory of Microbial Technology, Division of Microbial Science and Technology
Department of Bioscience and Biotechnology, Faculty of Agriculture
Graduate School, Kyushu University
6-10-1 Hakozaki, Higashi-ku, Fukuoka 812-8581

During this stay, I had the chance to meet with Prof. Sonomoto and Prof. Zendo with whom I had worked in the past. I also met other lab members such as Prof. Nakayama, as well as post-doctoral fellows, doctoral and master students.

The first few days were dedicated to the mutual presentations of research interests as well the exchange of experience and ideas. The French and the Japanese laboratories are both interested in the study of the antimicrobial peptides called bacteriocins. Yet, the two laboratories have different approaches of investigation. This was an opportunity for an exchange of ideas with lab members about the direction research on the beneficial effects of LAB is heading, and what can be done towards a better use of their natural potential. The weekly lab meetings which I attended were also animated by interesting discussions.

Seminar at the Faculty of Agriculture, Kyushu University.

This seminar took place on the 21st of January. It was titled "Proteomic characterization of probiotics in the context of new regulatory challenges for functional foods". This regards an important aspect of my current research which addresses probiotic bacteria and the wider prospect of using LAB bioactive peptides and proteins as biomarkers of positive impacts on the human and animal health. The goal of this research is the development of probiotic biomarkers for health-promoting functions. This research aims at developing new sets of biomarkers to measure the ability of bacteria to survive the gastrointestinal conditions and to adhere to the mucosa, but also their ability to show anti-bacterial, anti-inflammatory, immunostimulating, anti-carcinogenic and cholesterol lowering effects using a comparative proteomics approach in order to help select bacteria with probiotics properties. In these investigations, proteomes from LAB that are known for their probiotic activity, commercial ones, as well as from strains with no record of probiotic effects, are investigated for the presence of particular proteins/peptides that may be indicative of the studied activity. Matching probiotics with others strains of the same species helps highlight the relevant proteomic profiles. The developed biomarkers can be used in the selection of probiotic strains based on properties that are today investigated through in vitro screening tests, but most importantly individual proteins or sets of proteins are identified that may one day serve as bacterial biomarkers for properties which today can only be revealed through biological tests or heavy clinical trials.

Part of the seminar was dedicated to the new European regulation on scientific substantiation of health claims made on functional foods.

The seminar was followed with an interesting discussion on three aspects:

- 1) How the European regulation on functional foods compare to the Japanese one;
- 2) The Japanese market of functional foods as compared to the European market;
- 3) Differences in diet and health between Japanese and Europeans populations;
- 4) The possible use of genomic studies of probiotics as a complement to the proteomic ones;
- 5) The contribution of bacteriocins to the fitness of probiotics in the GI tract;
- 6) The use of proteomic studies to investigate the resistance of bacteria to bacteriocins and antibiotics.

Some of these discussion points opened prospects of cooperative projects, especially aimed at doctoral and post-doctoral student exchange. Hence, it was decided at the end of my stay to set up research projects through binational calls (ANR/JSPS, Sakura, etc). There will also be mutual invitations to conference talks in France and in Japan.

2) Networking activities

My networking activities in Japan were mainly through visits and exchanges with fellow researchers with the aim of exploring ways of exchanging students at the doctoral and post-doctoral levels, and establishing research programs with Japanese and/or European funding. The visited researchers were:

Tetsuya Hayashi, M.D. and Ph.D.
Department of Bacteriology,
Faculty of Medical Sciences,
Kyushu University,
3-1-1 Maedashi, Higashi-ku,
Fukuoka City, Fukuoka 812-8582

Visit on the 22d December 2015

Open discussion about common interests and research subjects. Prof. Hayashi presented his research on:

- Microbial genetics of pathogens
- Microbial metagenomics of gut microbiota

Exchange on how both techniques can be used, respectively, to characterize probiotic bacteria and differentiate high potential strains from other strains, and to establish the effects of changes in diet on the overall gut microbiota composition.

Discussion on ways to establish cooperation projects through ANR/JSPS binational calls and involve each other through speech invitations and conference presentations.

Discussion on teaching issues in the Faculty of Medical Sciences and the Faculty of Pharmacy of Strasbourg.
Working lunch

Prof. Tetsuya Tominaga
Saitama Industrial Technology Center North Institute
2-133 Suehiro, Kumagaya, Saitama

Visit on the 12th January 2016

Open discussion about common interests and research subjects. Prof. Tominaga presented his research on:

- Mutational investigations of bacteriocins
- Bacterial strain typing

Discussion on the ways of improving antimicrobial peptides' efficiency (higher activity and wider spectra) through targeted substitutions of amino acids. This could a way to obtain, among other things, activity against Gram-negative bacteria when it comes to using bacteriocins from lactic acid bacteria. Also, significant activity against strains which are multi-resistant to conventional antibiotics could be obtained.

A shared interest on this topic was expressed in light of previous works by the Japanese and the French laboratories and the future prospects of their research.

As far as strain typical is concerned, the discussion was on ways of tracing spoilage or pathogenic strains in industrial settings and throughout the food chain. The possibility of using bacteriocins with this aim was discussed. Strains could be identified in fact based on their sensitivity profiles to various narrow range bacteriocins. Also, the possibility of using bacterial proteomics, currently carried out in the French laboratory, in identifying and tracing strains was raised.

This was followed by a visit of the research center's facilities including the various laboratories and the pilot scale food processing facility.

The visit ended with a working lunch and a discussion on the means available to build cooperation projects through ANR/JSPS binational calls and involve each other through speech invitations and conference presentations.

Dr. Yimin Cai
Research Leader
Animal Physiology and Nutrition Division
National Institute of Livestock and Grassland Science (NILGS)
2 Ikenodai, Tsukuba, Ibaraki, 305-0901 Japan

Visit on the 13th January.

Discussion on common topics of interest around fermentation and bacteriocin production.

Presentation by Y. Cai of current research topics at the NILGS with a special focus on silage fermentation.

Discussion on the current commercial status of a bacteriocin producing starter culture used for silage fermentation. This culture contain a bacterial strain isolated and characterized during the post-doctoral stay of Saïd Ennahar at the NILGS in Nishinasuno.

Presentation by S. Ennahar of current research topics in the French laboratory with a special focus on antimicrobial peptides. Exchange of ideas on ways to boost cooperation between the two laboratories, especially through short-term stays of researchers and binational research projects. Dr. Cai expressed interest in developing a more potent starter culture for silage that would belong the *Lactobacillus* genus rather than the *Lactococcus* genus as is the case currently. This is set to be a likely good start for future work. The visit ended with a tour of the laboratory and a meeting with its head Dr. Hiroyuki ABE.